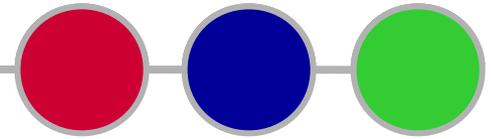




Watersheds, the Water-Cycle, and You

**WSU Cooperative
Extension King County**



Watersheds, the Hydrologic-Cycle and You

- What is a Watershed
- The Water-Cycle
- Natural Watershed Features
- **Humans and Watersheds**
 - **Land Uses**
 - **Degradation Processes**
 - **Management and Mitigation**



Human Land Uses

- **Forestry**
- **Agriculture**
- **Land Development**
- **General Household Practices**
- **Recreation (such as boating and fishing)**



Forestry



Photo courtesy of Rural Technology Initiative



Photos courtesy of USFS

**King County
lost 33% of its
forestland
between 1972
and 1996**



Western King County

1972



1996



Agriculture



Willamette (Oregon) and Puget Sound (Washington) Valleys had 283,000 acres of farmland converted to urban between 1982 and 1992. 78,000 of these acres were prime or unique farmlands



Land Development



King County's population up 40 percent between 1980 and 1998, from 1.2 to 1.7 million.

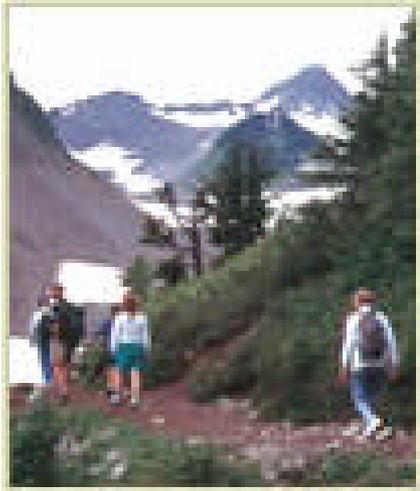


Photos courtesy of USDA NRCS

General Household Practices



Recreation



Photos courtesy of (clockwise from middle top): USDA-NRCS, USFS, Washington State Parks (bottom three) and USFS.



Watershed Degradation Processes

- **Physical**
- **Chemical**
- **Biological**

Physical

- **Remove/Displace Water**
- **Clear Vegetation**
- **Create Impervious Surfaces**
- **Alter wetlands, stream channel, shoreline**
- **Sedimentation**
- **Temperature Alteration**
- **Debris and Trash**

Removal or Displacement of Water



From river to
reservoir...



to pipeline...



to you.

Removal or Displacement of Water

- **Many water uses...**
- **Draw down and move surface and groundwater.**
- **Less water of lower quality available to replenish streams and aquifers.**

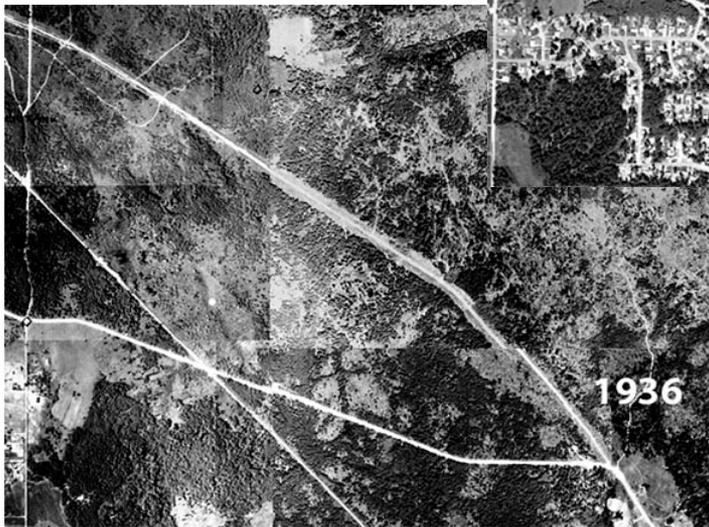


Removal/Clearing of Vegetation

- Less pools/riffles...wider and shallower stream
- Less aquatic life
- More sediments/pollution and bank erosion
- Higher water temperatures
- More flooding and lower late summer flows



Creation of Impervious Surfaces Near Renton, King County



Photos courtesy of King County

Impervious Surfaces

Causes and Effects

- **Causes**
 - **Forest Loss**
 - **Soil Compaction/Grading**
 - **Land Development**
- **Effects**
 - **More surface water runoff**
 - **Water quality impacts**
 - **Potential fish habitat and wetland impacts**

Alteration of Wetland, Stream Channel or Shoreline

- Filling
- Draining/Ditching
- Damming
- Dredging
- Diking
- Channelizing
- Armoring
- Culverting/Piping



Sedimentation

- **Surface water runoff**
- **Stream bank erosion**



Temperature Alteration

- **Loss of riparian shade**
- **Stream widening**



Debris and Trash



- **Illegal dumping**
- **Street litter**
- **Yard waste (lawn clippings, leaves)**

Sources of Chemical and Biological Pollutants

- Point Sources
- Non-Point Sources



Photo courtesy of USDA-NRCS

Chemical

- Herbicides
- Pesticides
- Fertilizers
- Industrial/Household
- Automotive



Biological

- Pathogens and Bacteria
- Manure and Sewage/Septic
- Invasive Non-Native Plants



Giardia lamblia – Cyst in stool

By D. Despommier

<http://www-medlib.med.utah.edu/parasitology/>

If images are used outside this program for any other purposes, proper credit to the original contributors is required

Invasive Non-Native Plants



English Ivy
close-up and
in the
woods.



Scotch Bloom

Management and Mitigation Practices

- **Regulatory and Non-Regulatory**
- **Technology and Engineering**
- **Prevention and Conservation**
- **Restoration**
- **Civic Participation**

Regulatory Practices

- **Government laws and regulations:**
 - Federal: activities and resources on federal land
 - State: activities and resources on state land
 - Local: land use activities such as building
- **May apply to:**
 - Water quantity and quality
 - Watershed features (wetlands, stream buffers)
 - Fish and wildlife
 - Land use activities
- **To be effective...must be enforced.**

Non-Regulatory Practices

- **Best management practices (BMPs)**
- **Tax incentives**
- **Direct monetary compensation**
- **Technical assistance**
- **Homeowner education**

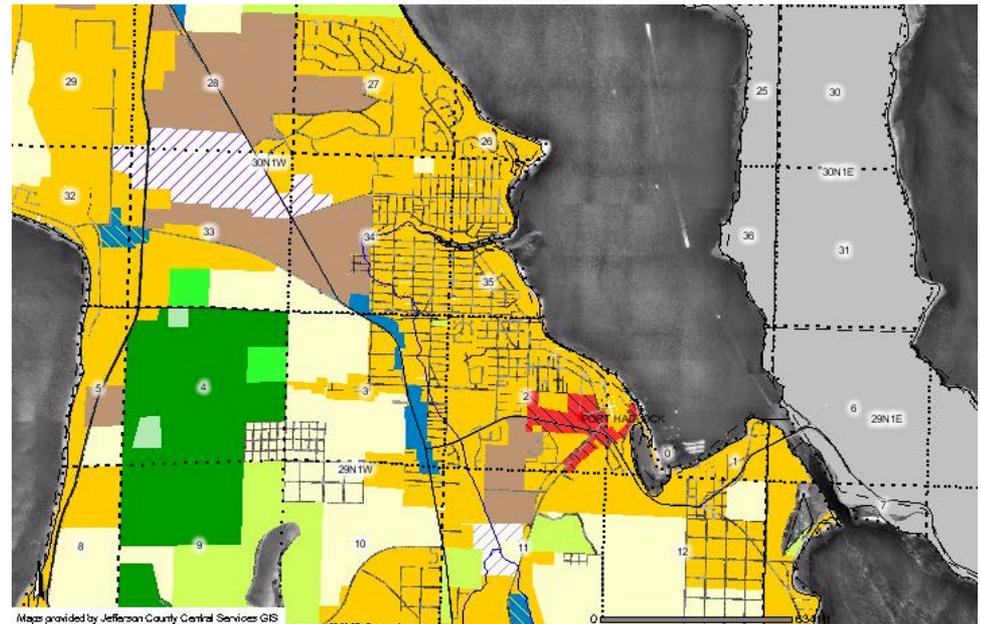


Technical assistance on preparing farm plan.

Photo courtesy of WSDA-NRCS

Technology and Engineering

- Used extensively
- Address existing impacts (e.g. wastewater, cleared land.)
- Water quality and quantity:
 - Water retention and treatment
 - Water conservation
- Required by regulation and/or integrated into BMPs.
- Geographical Information System mapping and planning



Prevention and Conservation

- **Address watershed impacts before they occur:**
 - **Use non-toxic alternatives**
 - **Conserve water in and outside of the house**
 - **Acquire land to protect water quality, wildlife, and open space.**

Restoration

- Restore degraded watershed features:
 - Plant native vegetation
 - Replace road culverts
 - “Rebuild” streambeds
- Supported by:
 - Fishery enhancement groups
 - Conservation districts
 - Government agencies
 - Volunteer groups
- Public and private land funding



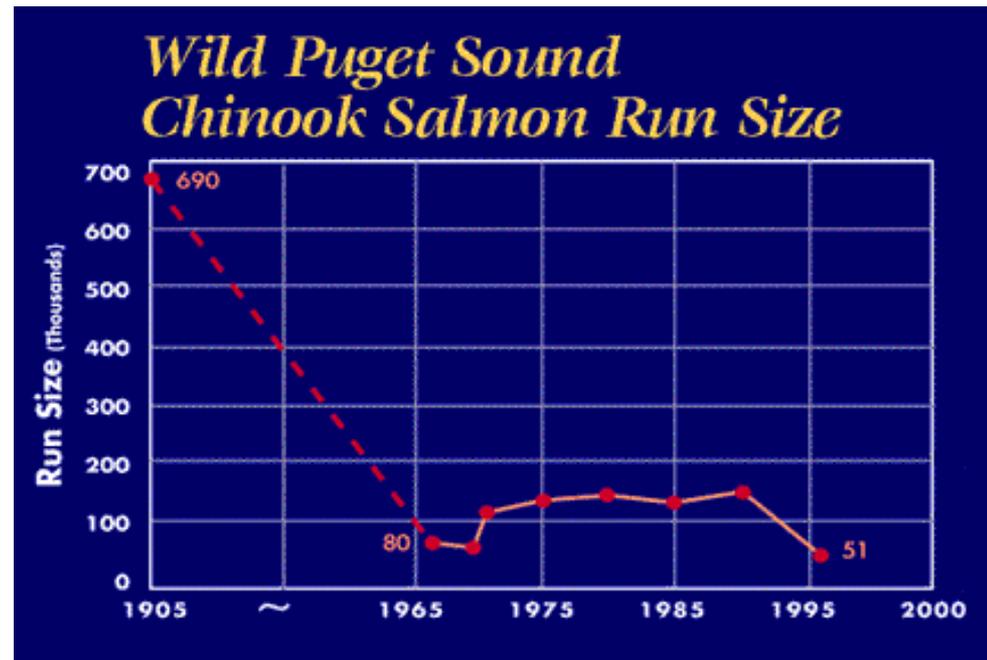
Civic Participation



- **Importance of public participation:**
 - Cornerstone of democracy
 - Sustains good planning decisions
 - Reduces costs
 - Maintains trust in government
- **Avenues for public participation:**
 - Community meetings
 - Public meetings and hearings
 - Written comments
- **Land use conflicts:** where desire to protect a public benefit restricts human activities

Case Study: Decline of Wild Salmon

- More than 314 stocks of PNW salmon at moderate to high risk of extinction in coastal WA, OR, and northern CA.
- Resident fish also in decline and at risk (bull trout, Oregon Chub, and Olympic Mudminnow).
- Physical, Chemical, and Biological factors of decline



From King County
Salmon Speakers
Bureau Slide Show

Factors of Decline

- **Physical habitats simplified**
- **Loss of secondary channels, oxbows, and backwaters...important fish habitats.**
- **Change from forests/wetlands to impervious surfaces**
- **Loss of riparian vegetation**
- **Dams/water allocations**
- **Other fish barriers (culverts, pipes)**
- **Water pollution (point and non-point sources)**
- **Sedimentation/erosion**
- **Hatchery salmon (competition/disease/genetic changes)**
- **Pulse (natural) versus Press (human) disturbances**

Goals of Salmon Recovery

- **Use Management and Mitigation Practices to:**
 - **Maintain/restore natural watershed processes**
 - **Maintain/restore habitat and network of refugia**
 - **Maintain connectivity between high quality habitat**
 - **Maintain genetic diversity**



